Section 5 Sevier River Basin
WATER SUPPLY AND USE

Tables

Figures

Section 5 Continued

Water Supply And Use

The Sevier River is one of the most completely consumed rivers in the United States.

5.1 INTRODUCTION

This section discusses the present water supply available and the water use from the Sevier River as well as its tributaries. Water supplied to and used from groundwater sources, primarily wells and springs, is also discussed.

Projected water uses and demands are discussed in Section 9, Water Planning and Development. Section 10, Agricultural Water and Section 11, Drinking Water, discusses these respective uses in more detail.

There are surface water exports and imports, and groundwater movement into the basin from other areas as well as groundwater flow out of the basin.

5.2 BACKGROUND

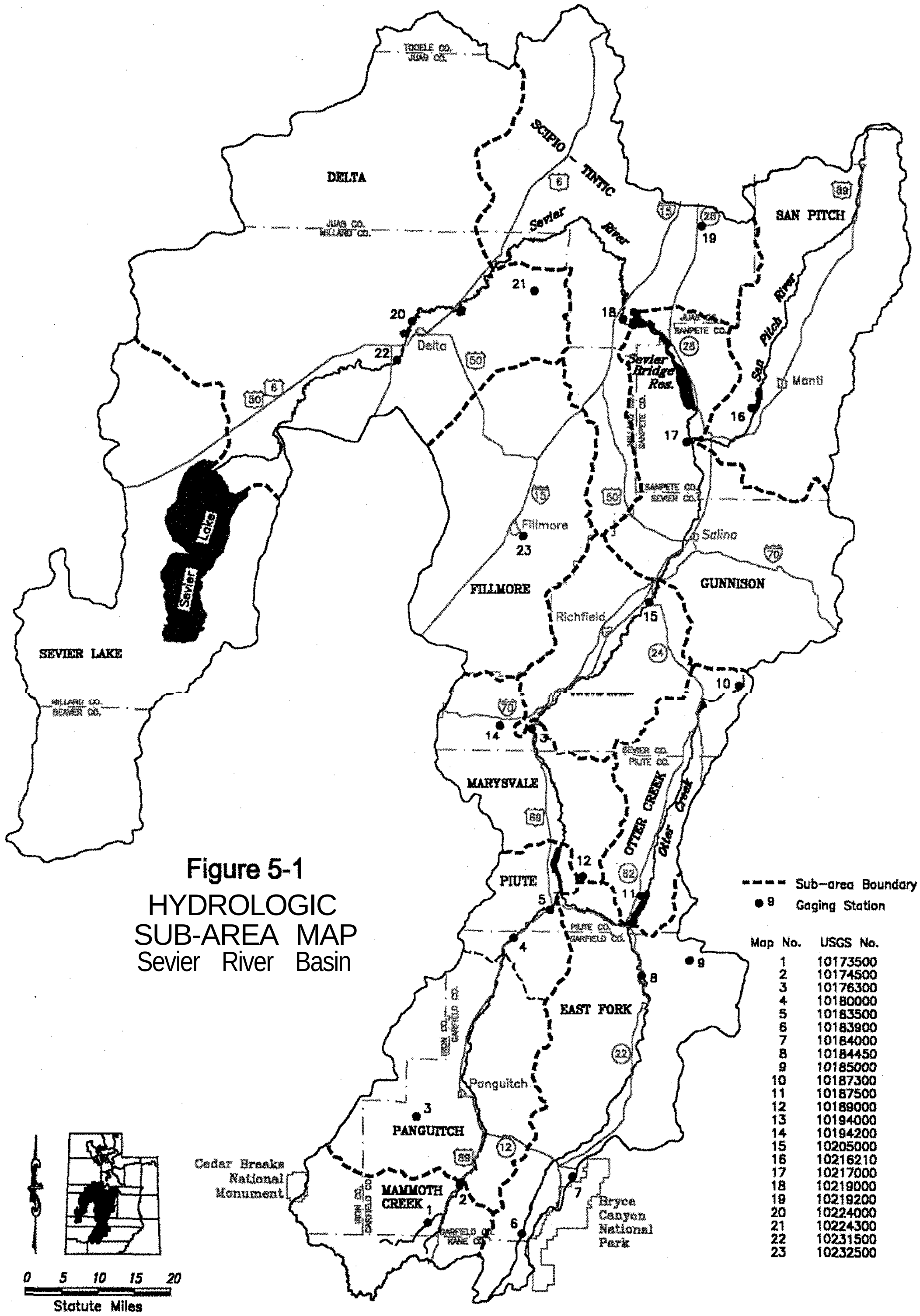
The Sevier River was divided into 13 subbasins or subareas[16,20] by the Division of Water Resources (See Figure 5-l). This made it possible to prepare more accurate water budgets and to present the water and related-land resources data for smaller, more specific areas and in a more understandable manner.

The base period used in this plan for determining and presenting the surface water supply is 194 1- 1990. Some of the groundwater data are discussed for different time periods depending on the records available. The municipal and industrial water-use data are for 1996.[18] The water-budget water supply data are based on the period 1951-1980.

A water budget[16] is an accounting procedure for determining all the water inflows, supplies, uses and outflows within a given hydrologic area (these are the subareas referred to above). These areas were delineated to take advantage of hydrologic and geologic conditions that limit unknown variables. Water budgets were based on more recent data than was used in the decrees apportioning the Sevier River. As a result, they will not agree. Surface water and groundwater data were provided primarily by the Division of Water Rights, the river commissioners, Division of Water Resources and the U.S. Geological Survey. There are some short-term (1963-65) current- meter measurement data on ungaged streams available from the Natural Resources Conservation Service."

The land-use inventories covered the lower valley areas where the agricultural croplands and the cities and towns are located. The land use was inventoried under contract between the years 1981 and 1985. This inventory provides the acreages used to calculate the water budgets.[16] A more recent land-use inventory was made in the upper Sevier River area in 1993 and the balance was completed in 1995.[21] Because of time constraints, water budgets have not been prepared using this later data. This later land-use data is shown in Table 10-2, Section 10, Agricultural Water. All of the land-use data shows what was on the ground at the time of the inventory. As a result, these acreages will vary from those presented in Bacon's Bible and used in the Cox Decree.

Much of the main stem surface-water supply comes from the Sevier River and East Fork (including Otter Creek) of the Sevier River above Piute Reservoir. The San Pitch Subarea produces over one-fourth of the total yield. There are several gages where the recorded flow is around 200,000 acre-feet annually, depending on the period of record. Major tributaries include Clear Creek, Salina Creek, San Pitch River and Chicken Creek. Chalk Creek and Corn Creek are important tributaries that do not flow directly into the Sevier River.



Map No.	USGS No.
1	10173500
2	10174500
3	10176300
4	10180000
5	10183500
6	10183900
7	10184000
8	10184450
9	10185000
10	10187300
11	10187500
12	10189000
13	10194000
14	10194200
15	10205000
16	10216210
17	10217000
18	10219000
19	10219200
20	10224000
21	10224300
22	10231500
23	10232500

Figure 5-1
HYDROLOGIC SUB-AREA MAP
Sevier River Basin

Many normally dry drainages experience short-duration flows produced by high intensity cloudburst-storms or snow-melt runoff. These are not a dependable supply of surface water.

The primary use of water is for irrigation. Developing irrigation systems was one of the first activities undertaken by the early settlers. Culinary supplies originally came from surface water sources or nearby springs. Later, wells were dug and springs improved to provide good culinary water for the growing communities.

5.3 WATER SUPPLY

The total water supply comes from precipitation except for the small surface-water transmountain diversions along the Wasatch Plateau and the groundwater inflow through the Gunnison Plateau and from the Awapa Plateau. Native vegetation in the upper watersheds consumes up to 90 percent of the precipitation. This need must be met before there is surface water runoff or infiltration to supply groundwater aquifers that feed springs and provide groundwater inflow. Because of this relationship, .a small change in precipitation can cause a large change in water yield. This is particularly true in the semi-arid area where the Sevier River Basin is located.

The Sevier River Basin is water short on a long-term basis. The average water supply is short of the normal demand by about 12,340 acre-feet. This is based on average water budgets (1951-80)[16] and the land-use inventory of irrigated lands during 198 1-85.[20] Generally, small volumes of groundwater are pumped except in the Sevier Desert and Pahvant Valley where use is high every year and to be lesser degree in Southern Juab Valley.

5.3.1 Surface Water Supply

Captain C.E. Dutton, during studies in 1875-77,[25] reported the flow of the Sevier River in the upper end of Sevier Valley was about 1,000 c.f.s in July and about one-half that amount in September. J.W. Powell reported that on July 6 & 7, 1877, the East Fork of the Sevier River was flowing 410 c.f.s., the South Fork of the Sevier River was flowing about 450 c.f.s. and the San Pitch River at Gunnison was 60 c.f.s.

Most of the surface water runoff comes from snow-melt during the months of April, May and June. Tributary streams peak at different times depending on the watershed aspect, elevation and configuration. Surface water flows are also modified by storage reservoirs. In the lower reaches of the river system, much of the streamflow is made up of return flows from upstream irrigation. This tends to modify the river flow even further. It takes about one year for a major climatological event in the upper watersheds to be reflected in the lower reaches of the system.

Figure 5-2 is a graphical representation of the average annual streamflows, diversions and return flows for the period 1941 to 1990. This is the base period used for all surface water data except the water budgets. The width of the arrows and bands indicates the average annual flow volume. The flow volumes are derived or estimated from stream gage data, other records and by correlation. Some of the stream gages are operated by the U.S. Geological Survey on a cost-share basis with various state and local entities (See Figure 5-l). A few gages are also part of a real-time water management project carried out with assistance from the Bureau of Reclamation.[45]

The annual and monthly mean flows for most stream gages are given in Table 5-l. These flows are for the period of record indicated in the table. The annual flows at several locations are shown graphically as follows: Sevier River at Hatch, Figure 5-3; Sevier River and East Fork Sevier River near Kingston, Figures 5-4 and 5-5; Sevier River above Clear Creek, Figure 5-6; Sevier River below San Pitch River, Figure 5-7; Sevier River near Juab, Figure 5-8; and Chalk Creek near Fillmore, Figure 5-9. The maximum and minimum daily flow is given in Table 5-2.

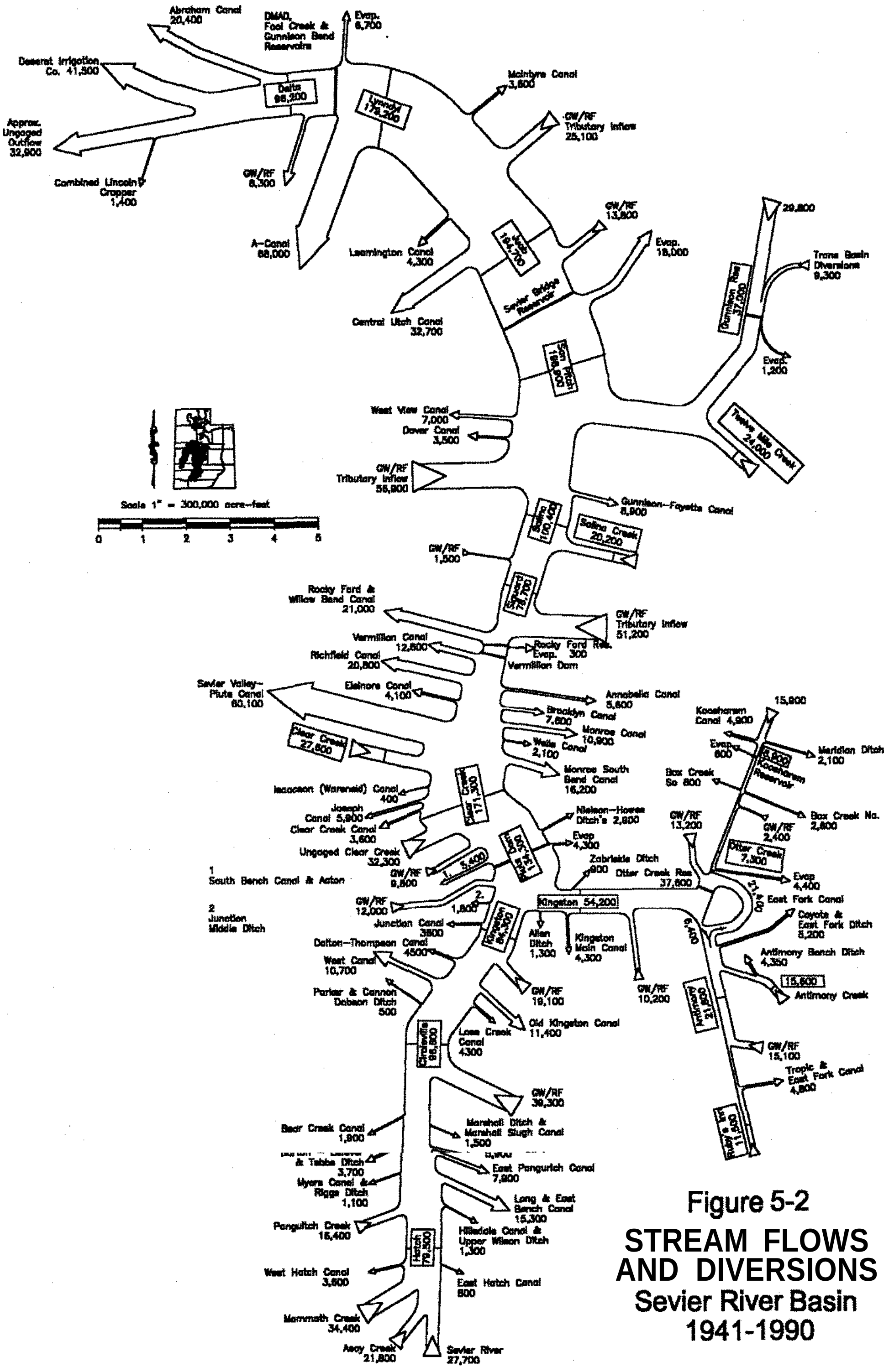


Figure 5-2
STREAM FLOWS AND DIVERSIONS
Sevier River Basin
1941-1990

Sevier River Basin

Table 5-1
ANNUAL AND MONTHLY FLOWS

(acre-feet)

Gauge #	GaugeName	Years	Oct.	Nov.	Dec.	Jan	Feb.	Mar	Apr.	May	Jun.	Jul.	Aug.	Sep.	Ann
10173450	MAMMOTH CREEK ABV WEST HATCH DITCH, NEAR HATCH,	65-96	1,291	1,045	865	723	645	786	1,744	10,672	10,513	3,775	2,061	1,481	35,602
10173600	MIDWAY CR NR HATCH UT	58-62	0	0	0	0	0	0	0	389	252	0	0	0	641
10173900	DUCK CREEK NR HATCH, UT	54-59	366	281	227	111	68	67	278	2,064	2,416	1,024	721	553	7,000
10174000	ASAY CR. ABV WEST FORK NR HATCH, UT	54-59	1,510	1,330	1,298	1,102	906	1,009	1,959	5,486	3,685	2,290	1,857	1,644	17,89(
10174500	SEVIER RIVER AT HATCH, UT	15-28	4,689	4,421	4,210	3,853	3,718	4,678	7,757	20,946	16,044	7,488	5,630	4,684	87,08(
		40-96													
10176300	PANGUITCH CREEK NEAR PANGUITCH, UT	61-80	314	284	243	222	279	456	1,267	2,695	4,048	3,132	2,667	1,333	16,787
10180000	SEVIER RIVER NEAR CIRCLEVILLE, UT	12-27	6,375	7,570	7,915	7,183	7,315	9,066	9,906	18,391	14,163	6,444	5,972	5,504	96,928
		50-95													
10183500	SEVIER RIVER NEAR KINGSTON, UT	14-95	5,116	7,742	8,917	88,169	1 5	1,549	9,433	13,974	9,422	3,19	3,271	3,510	89,373
10183900	EAST FORK SEVIER RIVER NEAR RUBYS INN, UT	62-95	618	615	533	495	534	957	2,202	3,419	1,391	630	580	523	12,496
10184000	TROPIC AND EF CANAL NEAR TROPIC, UT	50-60	92	1	0	0	0	0	69	610	745	533	365	271	2,583
10184450	E FK SEVIER RIVER NEAR ANTIMONY, UT	61-66	1,148	1,144	1,173	1,134	1,527	3,110	3,988	4,379	1,778	1,150	1,204	1,178	19,682
		61 has just the last three months													
10185000	ANTIMONY CREEK NEAR ANTIMONY, UT	47-48	1,002	984	1,034	1,008	924	1,032	1,518	3,474	1,317	1,006	1,013	963	14,670
		58-76													
10187300	OTTER CREEK NEAR KOOSHAREM, UT	75-82	583	530	521	500	459	538	734	1,627	1,213	793	653	582	7,923
10187500	OTTER C AB. RES. NR. ANTIMONY, UT	61-64	83	534	838	825	1,370	2,194	871	357	81	22	10	17	6,210
		71-80													
10189000	EAST FORK SEVIER RIVER NEAR KINGSTON, UT	13-84	2,279	1,608	1,385	1,366	1,444	2,362	4,622	10,082	8,956	10,300	8,284	5,058	56,962
10189001	COMBINED FLOW SEVIER R AND E FK SEVIER R	44-77	6,019	8,441	9,423	8,455	9,046	10,732	9,776	15,933	14,200	10,898	9,593	7,119	119,635
10190500	SEVIER RIVER NEAR JUNCTION, UT	11-16	391	449	507	412	441	1,001	10,067	6,774	2,971	855	513	431	24,811
10191500	SEVIER RIVER BELOW PIUTE DAM, NEAR MARYSVALE, UT	11-96	3,633	2,213	1,555	1,439	3,107	4,450	11,536	17,103	13,909	16,240	13,669	7,579	95,326
10194000	SEVIER RIVER ABOVE CLEAR CREEK, NEAR SEVIER, UT	11-16	8,314	5,363	4,087	3,608	5,641	7,499	14,576	30,218	29,215	29,584	24,063	15,671	175,084
		39-95													
10194200	CLEAR CREEK ABOVE DIVERSIONS, NEAR SEVIER, UT	57-95	815	728	661	638	749	1,393	3,267	8,283	6,559	2,427	1,116	802	25,612
10195000	"LEAR CREEK AT SEVIER, UT	12-19	400	595	807	848	872	1,319	3,245	6,412	5,268	1,417	429	232	21.70;
		41-58													
10195500	SEVIER RIVER AT SEVIER, UT	17-29	16,555	10,594	6,518	4,941	3,343	6,801	22,761	50,091	42.215	38,259	29,463	20,493	251,776
10204200	MILL CREEK NEAR GLENWOOD. UT	63-74	0	0	0	0	0	2	0	4	0	1	2	0	(
10205000	SEVIER RIVER NEAR SIGURD, UT	44-96	5,023	6,022	7,587	8,058	10,134	11,278	8,028	7,232	8,416	2,056	1,579	3,164	77.18
lo205030	SALINA CREEK NEAR EMERY, UT	64-96	616	495	441	402	362	468	898	4,177	2,813	1,071	854	684	13,280
10205100	SHEEP CREEK NEAR SALINA, UT	58-69	5	4	4	4	3	4	9	66	90	30	10	6	23.'
10205200	WEST FORK SHEEP CREEK NEAR SALINA, UT	58-69	0	0	0	0	0	0	7	72	20	1	0	0	10

Sevier River Basin

Table 5-1 Continued - -
ANNUAL AND MONTHLY FLOWS
(acre-feet)

10205300	SHEEP CREEK AT MOUTH NEAR SALINA, UT	58-69	8	7	7	6	6	11	65	294	159	41	13	8	623
10206000	SALINA CREEK AT SALINA, UT	18,19	507	818	826	858	1,007	1,255	1,886	8,023	3,908	387	263	131	19,450
		43-55 61-95													
10206001	SEVIER RIVER BELOW SALINA CREEK NEAR SALINA, UT	44-86	5,947	7,179	8,789	9,072	11,193	12,157	10,903	17,578	13,608	2,544	2,057	3,644	101,987
10208000	SEVIER RIVER NEAR GUNNISON, UT	10-17	21,391	22,609	22,407	21,770	20,700	31,374	21,974	26,181	19,328	6,364	8,995	11,344	220,826
10215500	BIG HOLLOW AT FOUNTAIN GREEN, UT	65-68	0	0	0	0	0	22	10	0	1	4	4	1	41
10215700	OAK CREEK NEAR SPRING CITY, UT	65-74	324	275	254	230	206	228	306	1,586	2,612	990	478	357	7,615
		80-94													
10215900	MANTI CREEK BELOW DUGWAY CREEK, NEAR MANTI, UT	65-96	528	401	327	296	263	375	1,089	6,018	8,340	2,815	1,061	651	21,399
10216210	SAN PITCH RIVER NEAR STERLING, UT	65-80	263	68	406	1,205	2,544	4,919	4,499	3,744	3,739	4,504	4,037	2,636	32,564
10216400	TWELVEMILE CREEK NEAR MAYFIELD, UT	60-80	835	620	547	518	478	652	1,599	6,192	5,826	2,690	1,469	996	22,420
10217000	SEVIER RIVER BLW SAN PITCH RIVER, NR GUNNISON,UT	18-96	11,890	14,024	16,483	16,806	18,655	21,926	16,815	23,123	22,982	7,656	6,654	7,913	184,928
10219000	SEVIER RIVER NEAR JUAB, UT	12-96	3,870	1,982	2,140	3,784	3,540	7,185	17,983	45,221	36,101	33,437	22,564	10,088	185,780
10219200	CHICKEN CREEK NEAR LEVAN, UT	63-95	156	127	109	111	121	256	946	2,172	903	376	243	177	5,529
10220000	SEVIER RIVER NR MILLS, UT	14-17	20,257	13,740	3,873	3,493	3,563	9,850	27,150	53,280	46,993	37,595	32,853	29,270	261,435
10223500	SEVIER RIVER AT LEMMINGTON, UT	12-14	21,060	14,185	8,965	4,190	3,440	4,360	32,175	48,005	45,430	28,017	26,353	23,757	214,477
10224000	SEVIER RIVER NEAR LYNNDYL, UT	14-19	4,756	4,622	4,208	5,711	6,451	10,654	17,720	37,850	33,099	28,555	19,418	8,004	179,942
		43-96													
10224100	OAK CREEK ABOVE LITTLE CREEK, NEAR OAK CITY, UT	65-96	42	48	58	57	70	179	513	784	271	70	38	31	2,095
10224300	OAK CR. BELOW BIG SPRING NR OAK CITY, UT	79-86	315	292	310	371	439	1,008	2,165	3,345	1,803	696	414	335	9,099
10228000	SEVIER RIVER NEAR DELTA, UT	13-19	5,920	5,372	4,074	3,683	3,895	6,574	14,540	21,357	16,843	13,383	11,010	8,606	94,179
10231500	SEVIER RIVER AT OASIS UT	12-27	4,673	4,508	3,914	4,960	4,420	6,321	9,166	5,165	7,514	2,207	2,737	2,957	56,168
10232500	CHALK CREEK NEAR FILLMORE UT	45-71	649	620	615	621	674	1,105	3,610	7,831	3,517	1,266	829	635	21,970
10233000	MEADOW CREEK NEAR MEADOW UT	65-75	139	125	132	138	139	290	714	1,773	911	367	204	135	4,636
10233500	CORN CREEK NEAR KANOSH, UT	65-75	417	409	404	403	383	817	2,467	4,284	1,586	750	557	411	11,803

Source: U.S. Geological Survey Water Data Reports.
Note: Flows are for the period of record for each gage.

Figure 5-3

ANNUAL FLOWS

Sevier River at Hatch

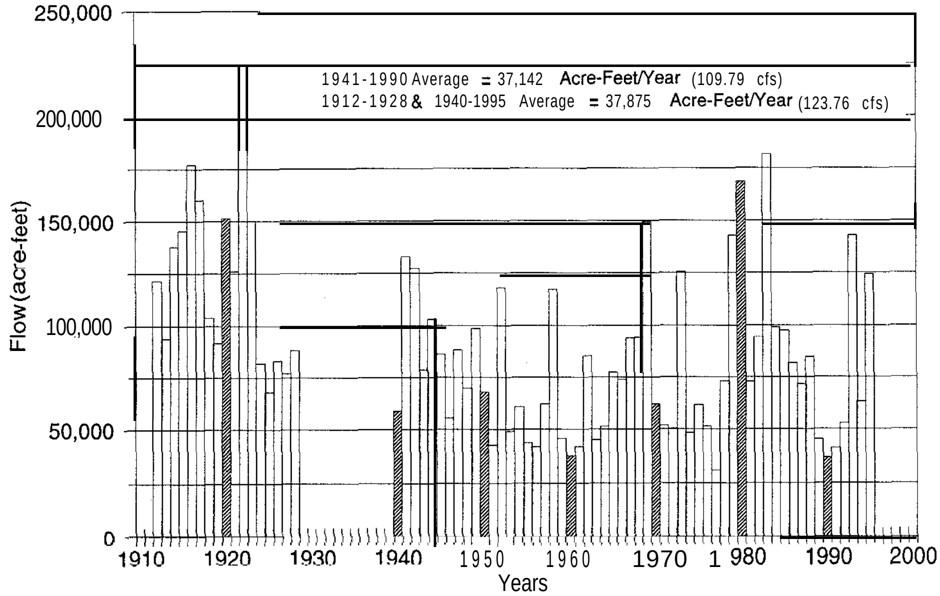


Figure 5-4

ANNUAL FLOWS

Sevier River near Kingston

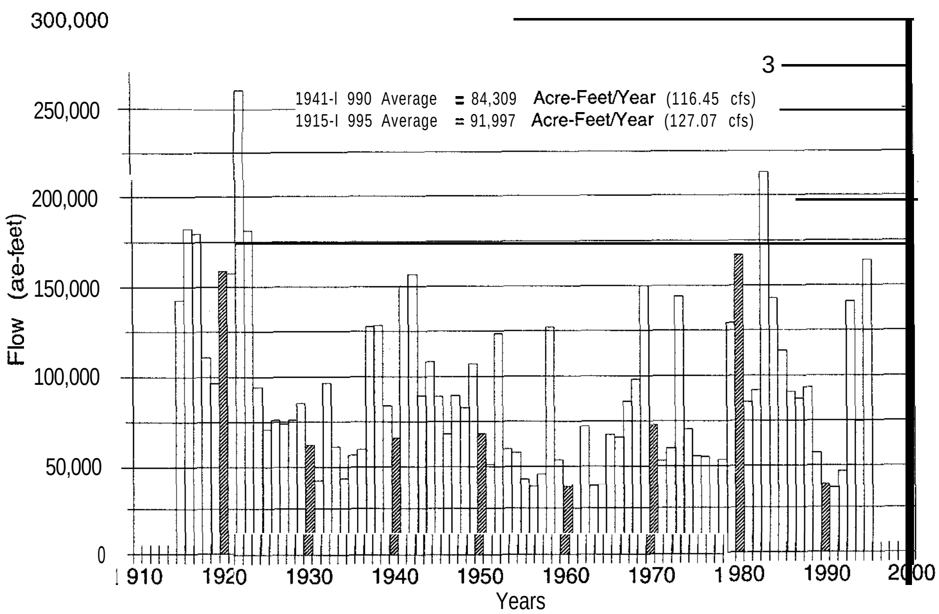


Figure 5-5

ANNUAL FLOWS

East Fork Sevier River near Kingston

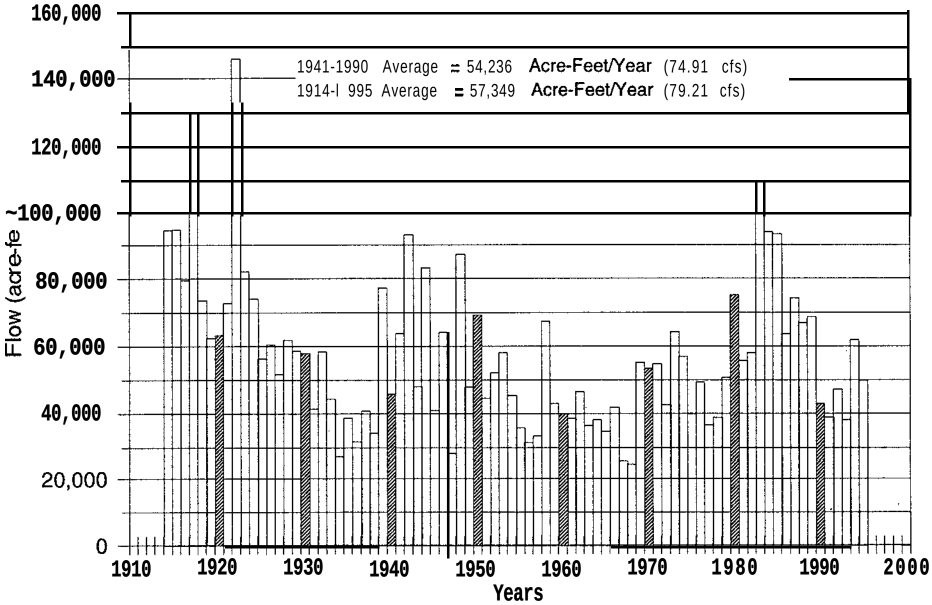


Figure 5-6

ANNUAL FLOWS

Sevier River above Clear Creek

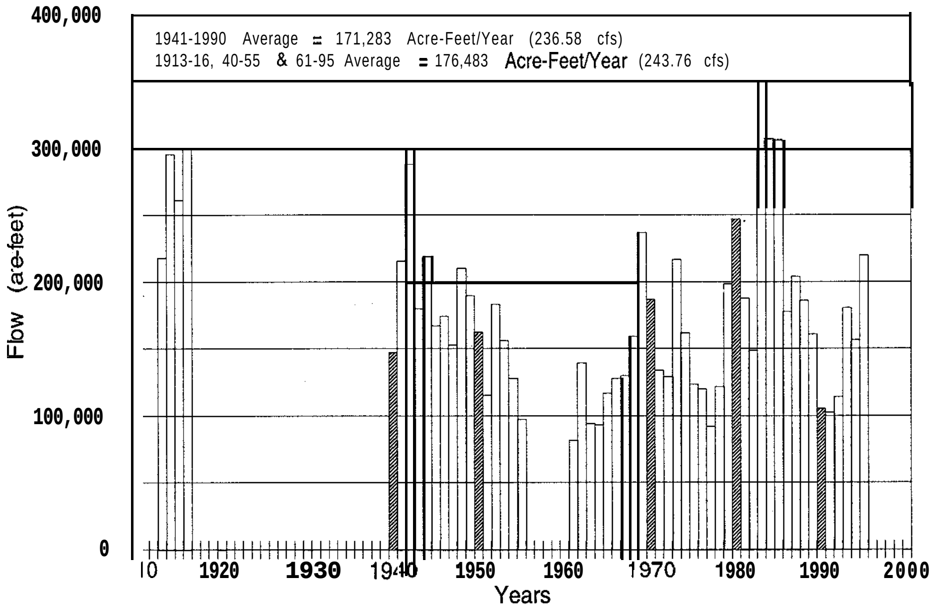


Figure 5-7

ANNUAL FLOWS

Sevier River below San Pitch River

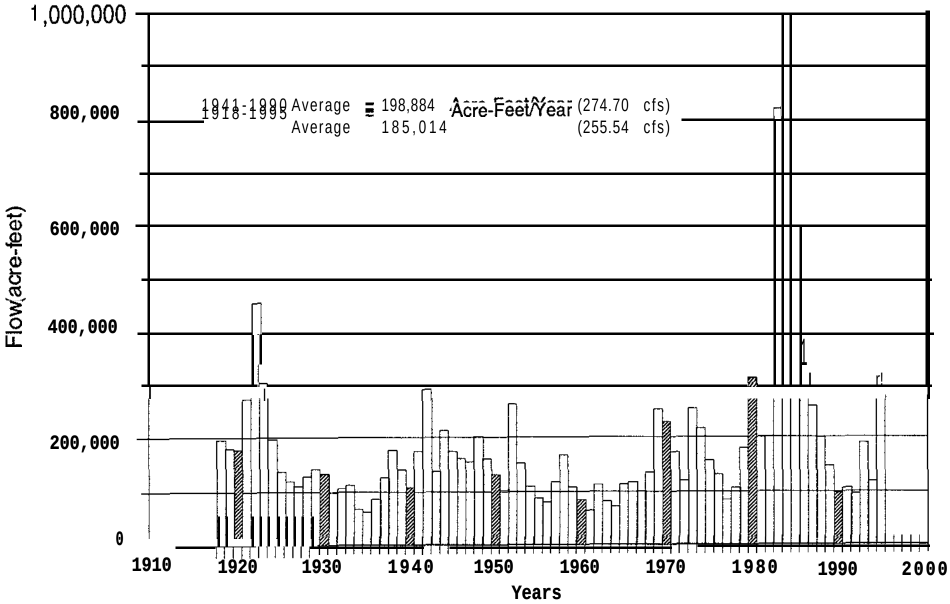


Figure 5-8

ANNUAL FLOWS

Sevier River near Juab

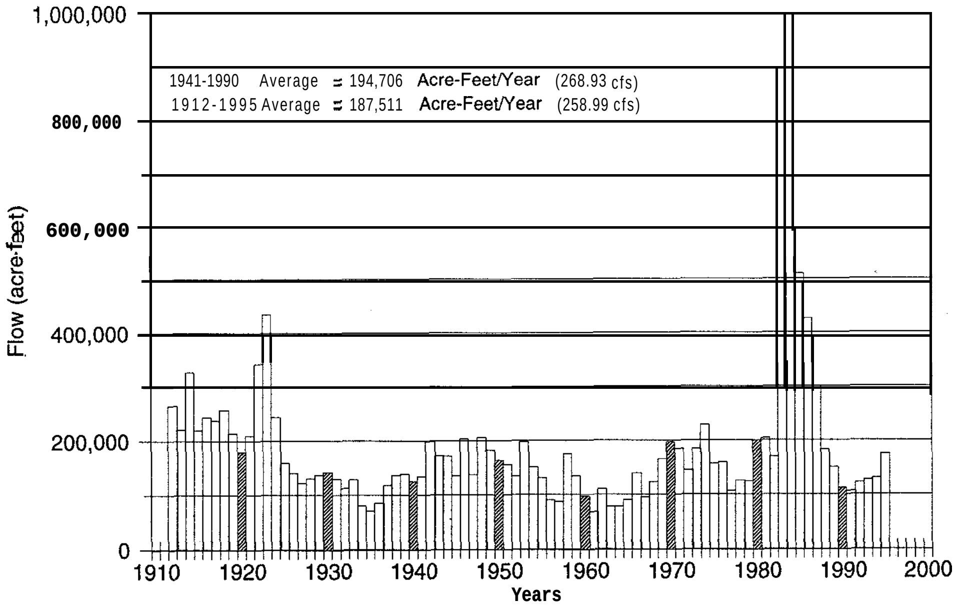


Figure 5-9

ANNUAL FLOWS

Chalk Creek near Fillmore

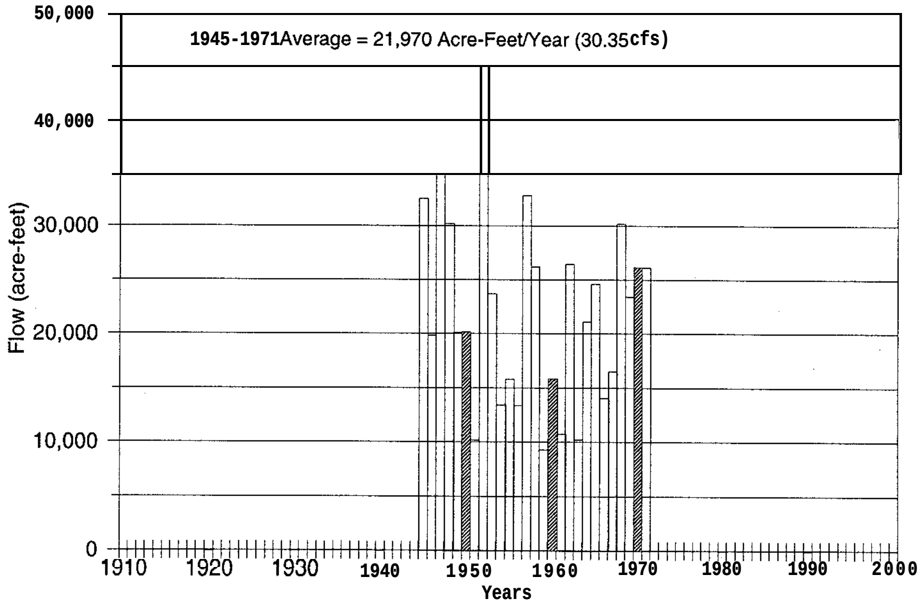


Table 5-2 PEAK FLOWS IN THE SEVIER RIVER BASIN						
Station	Max (cfs)	Date	HDM[a] (cfs)	Date	LDM[b] (cfs)	Date
Hatch	1,490	5-26-22	1,340	6-02-83	21	9-08-77
Kingston	3,000	3-04-38	1,560	6-03-83	2	7-24-63
EF Kingstson	2,030	5-12-41	1,740	5-12-41	6	2-25-77
SR nr Clear Cr.	2,500	6-03-83	2,450	6-02-83	6	1-1 1-79
Gunnison	5,400	5-29-84	5,400	5-29-84	6	7-18-77
Juab	5,190	6-25-83	4,920	6-25-83	0	3-07-18
Mammoth Cr.	838	6-19-83	720	6-19-83	1	1 1-20-77
Clear Cr.	906	8-26-88	623	5-24-84	2	1-26-79
Salina Cr.	2,650	6-07-84	1,620	5-13-84	0	8-13-62
Manti Cr.	705	6-28-95	547	6-28-95	2	1-08-81
Chicken Cr.	390	8-08-81	380	6-01-83	0	12-24-90
Chalk Cr.	1,850	7-31-81	NA		3	12-12-63

a High Daily Maximum
b Low Daily Minimum
Source: USGS Surface Water Records

The dampening effect of the major reservoirs is apparent as shown by daily records of gages below and above those facilities. The exception is during extremely wet years such as 1983-84. The gage on Chalk Creek reflects a typical tributary inflow from an unregulated watershed.

Variations in runoff patterns will be different in a watershed such as Chalk Creek which is steeper and shorter (500 ft/mi) when compared to Salina Creek (150 ft/mi). Vegetation and soils also influence runoff patterns. The flows at different probability levels of the Sevier River at Hatch and near Gunnison are shown on Figures 5-10 and 5-l 1, respectively and of Chalk Creek near Fillmore on Figure 5-12.

A probability level of 90 percent means nine times in 10 the flows will be greater than the values shown. A level of 50 percent means near average conditions. The numbers are based on a log normal frequency analysis.

Most of the basin is prone to flash flooding from high-intensity, convective, summer thunderstorms. This type flooding has more impact on tributaries than on the main stem of the Sevier River.

Rapid snow-melt or rain on snow generally has more impact on main stem flows. The floods of 1983-84 were caused by a sudden increase in temperature melting a greater than normal snow pack with a moisture filled soil profile. As a result, flood flows in the Sevier River main stem continued well into the summer.

During water-budget compilation, river inflow into the area was determined from stream gauge records. Some tributary inflows (surface water yield) are ungaged. Ungaged flows were

Figure 5-10

MONTHLY STREAMFLOW PROBABILITIES

Sevier River at Hatch

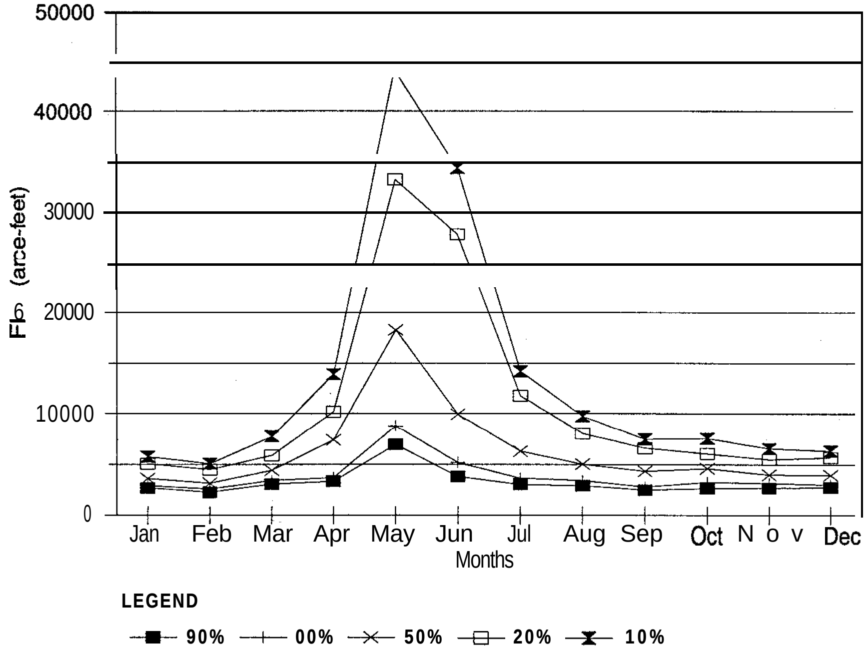


Figure 5-l 1

MONTHLY STREAMFLOW PROBABILITIES

Sevier River below San Pitch River near Gunnison

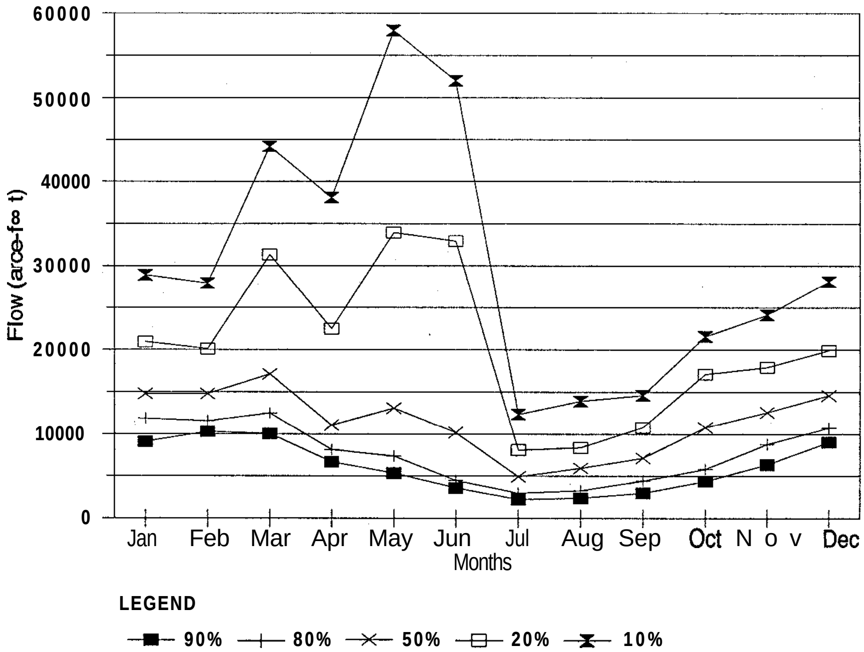
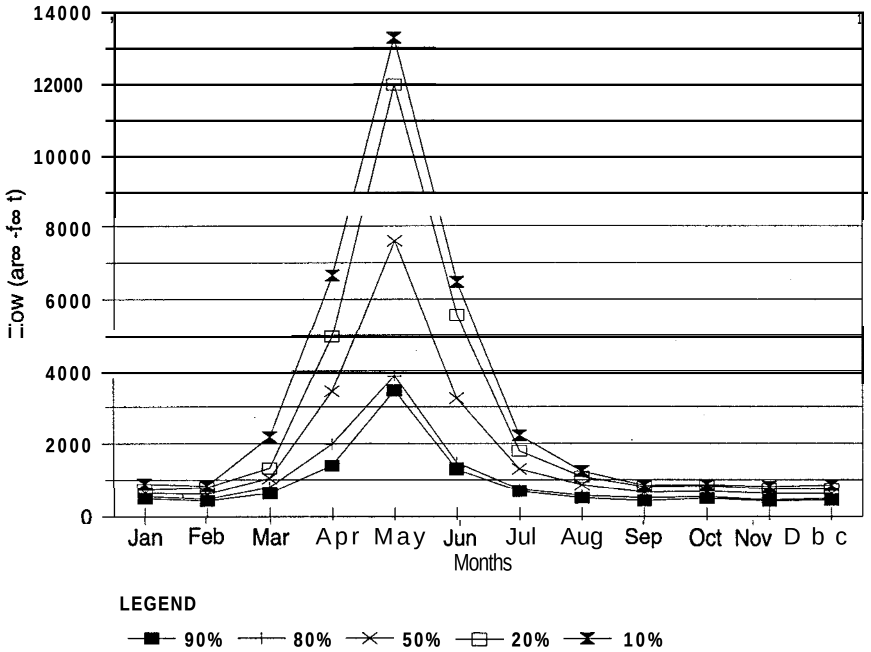


Figure 5-12

MONTHLY STREAMFLOW PROBABILITIES

Chalk Creek near Fillmore



correlated using nearby tributary gaged records. The average annual gaged river flows are shown in Table 5-1. The yield for each subarea is shown in Table 5-3.

53.2 Groundwater Supply

Groundwater is a vital part of the total water supply. This supply is utilized through wells, pumped and flowing; springs and seeps; and subsurface water which supports vegetation. Most of the groundwater supply is pumped from wells. These wells tap groundwater reservoirs located throughout the basin. See Figure 19-l.

There is substantial groundwater movement into and out of the basin. Groundwater originates on the west slope of the Gunnison Plateau in the Nephi area contributing to the spring flows in the Fountain Green-Wales area in Sanpete Valley. Groundwater from the Awapa Plateau in the Fremont River drainage supplies Antimony Spring in the East Fork of the Sevier River. There is groundwater outflow to the Colorado River drainage and to the Great Basin from the Paunsaugunt and Markagunt plateaus.[63] There is also groundwater flow from Pahvant Valley to Clear Lake Springs.[40] See Section 5.5.

Maior Springs - Many of the major springs appear above or near the edge of the water-budget area and are available for immediate diversion. The primary supply of water for diversion along the western side of Sanpete Valley and near Glenwood comes from springs. Mohlen and Blue springs are supplied by groundwater from the Scipio area and feed the Sevier River just below Yuba Dam. Data on water quality and yield from selected springs are shown in Table 5-4.

Groundwater Reservoirs - There are 18 groundwater reservoirs in the Sevier River Basin (See Figure 19-1). Most of these are along the Sevier River, each one separated from the ones upstream and downstream by relatively impermeable underground geologic restrictions. These reservoirs are recharged by water seeping from canals, the river channel, deep percolation from irrigation, precipitation and from groundwater tributary inflow.

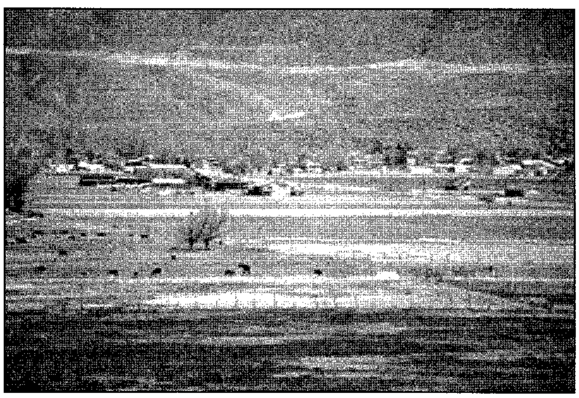
The Sevier Desert groundwater reservoir is beneath the delta formed when the Sevier River flowed into Lake Bonneville. It does not have distinct geologic boundaries like those upstream along the Sevier River. The Pahvant Valley groundwater reservoir is a southeast extension of the Sevier Desert groundwater reservoir. It contributes a small amount of groundwater flow to the Sevier Desert and supplies Clear Lake Springs. For additional information on the groundwater reservoirs refer to Section 19, Groundwater.

5.4 WATER USE

Most of the water supply is used for agricultural purposes. Other uses are for culinary, secondary and industrial purposes, commonly called municipal and industrial water; and water used by wet/open water areas.

5.4.1 Agricultural Water Use

Water diverted for agriculture is the largest use in the Sevier River Basin. The average annual amount of water diverted for cropland irrigation is 903,460 acre-feet. Of this amount, over 135,000 acre-feet are pumped from groundwater. About 40 percent of the diversions are return flows from upstream uses. The irrigated acreage and diversions to cropland reflect recent data and are not based on decreed water rights or land areas.[20] Table 5-5 shows the irrigated area and the average annual diversions for each county. See Section 10, Agricultural Water, for more information.



Agricultural land-Glenwood

Table 5-3
AVERAGE ANNUAL YIELD

Sub-area	Inflow (acre-feet)	Sub-area	Inflow (acre-feet)
Mammoth Creek	**94,260**	San Pitch	225,060[b]
Panguitch	26,710	Gunnison	**90,550**
Otter Creek	**27,980**	Scipio-Levan	**47,450**
East Fork	51,080[a]	Delta	41,280
Piute	27,610	Fillmore	**86,880**
Marysvale	61,130	Sevier Lake	0
Richfield	**42,890**		
		Total	**822,880**

[a] Includes 4,800 acre-feet export to Tropic and East Fork Irrigation Company in Paria River Drainage.
[b] Does not include 9,345 acre-feet of transmountain diversions from Colorado River drainage.

5.4.2 Municipal and Industrial Water Use

Municipal and industrial (M&I) water diversions average about 49,960 acre-feet.[18] Of this amount, industrial diversions are estimated at 26,290 acre-feet of which 1,170 acre-feet comes from public community systems. M&I water is classed as potable or non-potable. The term potable water is used interchangeably with culinary or public water supplying homes, both indoors and outdoors, parks, golf courses, school yards, and other outdoor uses. The total culinary water diverted in 1996 was 23,360 acre-feet of which 14,320 acre-feet was delivered by public water suppliers. Culinary water diversions and depletions are shown in Table 5-6. Table 1 l-3 provides more detail on culinary water use. See Section 18 for more information on industrial water use.

5.4.3. Secondary Water Use

Secondary water is of lower quality and is used to conserve culinary water. It is used to irrigate lawns and gardens, parks, cemeteries and golf courses. These systems can use water of less than culinary quality.

Secondary systems are owned and operated by cities and towns, irrigation companies and others. Secondary water use is shown in Table 5-7.

Palisade Golf Course

5.4.4 Wetland and Riparian Water Use

Most of the wetland areas inventoried in the water-budget areas are found along the main stem of the Sevier River and its major tributaries.

Table 5-4
SELECTED SPRINGS

Subbasin/Spring	Date	Specific Conductance (µS/cm)	Specific Conductance (mmhos/cm)	Yield (gal/min)
MAMMOTH CREEK				
Blue Spring	8-62			4,500:
Duck Creek	7-89	235	(7-54) 137[ab]	(7-54) 4,200[a]
Duck Creek	8-54		(8-54) 117[ab]	(8-54) 11,200[a]
Lower Asay	10-68	400	-	13,000
Mammoth	6-89	170	-	(4-57) 900[a]
Mammoth	6-57	-	103ab	121,000[a]
PANGUITCH VALLEY				
Marshall Slough	5-62	570	-	(8-56) 1,350
Marshall Slough	6-89	360	-	-
Veater Slough	10-62	-	-	450[a]
EAST FORK SEVIER				
Deer Creek	'60s	-	300[ab]	1,640[a]
Tom Best	7-62	410	246[ab]	500
OTTER CREEK				
Burr	7-62	-	120[ab]	1,400
MARYSVALE				
Barnson	'60s	-	271[ab]	5,400
Taylor	'60s	-	-	1,800[a]
RICHFIELD				
Black Knoll	1-58	-	-	5,000[a]
Black Knoll	8-88	-	740	6,960
Cove	5-58	-	338	4,650[a]
Ford Fish Hatchery	9-59	-	-	1,400[a]
Glenwood	'50s	-	159[ab]	4,500[a]
Joseph Hot	9-57	-	7,520	100[a]
Monroe	9-57	-	4,020	40[a]
Richfield	7-57	550		(date?)1,400
Spring Hill	'50s			4,500"
SANPETE VALLEY				
Big-Fountain Green	4-89	430		3.320
Big-8 mi.E. Ephraim				('60s) 1,350"
Birch Creek	4-89	800		7

Table 5-4 Continued

SELECTED SPRINGS

Subbasin/Spring	Date	Specific Conductance (µS/cm) (mmhos/cm)		Yield (gal/min)
Birch Creek	‘ 60s	-	-	2,700
Nine Mile	8-64	-	-	980
GUNNISON				
Fayette	10-87	1,000	-	1,900[a]
Michaelson-Willow	5-87	920	-	(12-59)500[a]
Redmond Lake	9-68	950	-	-
Redmond Lake	8-59	-	1,530[ab]	6,000[a]
SCIPIO-TINTIC				
Blue[c]	1-63	-	607	2,730
Chase	6-63	-	1,91	(1963)1,400
Mohlen[c]	10-62	-	725	10,350
Maple Grove	7-63	-	435	-
Palmer	4-94	-	4,190[b]	430
Rosebush	6-63	-	1,320[b]	-
DELTA				
Baker Hot (N Delta)	7-79		6,080[b]	1,200
Indian (lower Cherry Cr.)	8-79	-	1,100[b]	500
Lime Kiln (Oak Creek)	10-63	-	370[b]	-
Whiskey (NW McCormick)	4-79	-	590[b]	-
FILLMORE				
Church	9-85	-	620[b]	790
Devil's Ridge	12-85		13,000[b]	135
Wild Goose	9-85		640”	1,080

[a] Data. from USDA-SCS study (1969)

[b] Milligrams per liter (mg/L)

[c] 1963 was a dry water year. During wet water years, flows from Blue and Mohlen springs combined could reach 50 cfs (22,500 gpm) or more.

Note: Unless otherwise noted, data was taken from Division of Water Rights Technical Publications 98, 102, 103, 112, 113 and 114 along with their Basic Data Open-File Reports; and from U.S. Geological Survey Water Supply Papers 1787, 1794, 1836, 1848 and 1896.

Note: See Section A for definition of µs/cm and mmhos/cm.

Table 5-5[16,20]

IRRIGATION WATER USE BY COUNTY

County	Area (acres)	Diversions (acre-feet\year)
Beaver	Neg.	Neg.
Garfield	19,630	67,850
Iron	250	1,010
Juab	21,690	25,300
Kane	200	720
Millard	134,050	294,330
Piute	22,230	66,540
Sanpete	115,030	25 1,200
Sevier	68,010	196,510
Tooele	Neg.	Neg.
Total	381,090	903,460

Note: Based on 1981-85 land use data and 1951-1980 water supply data.
No estimates were made for small acreages in Beaver and Tooele counties.

Table 5-6 CULINARY WATER PROVIDED BY PUBLIC WATER SUPPLIERS-1996[18]		
County/Use	Diversions (acre-feet)	Depletions (acre-feet)
Garfield	500	200
Juab	560	200
Millard	3,730	1,490
Piute	450	140
Sanpete	3,720	1,300
Sevier	5,360	1,880
Total	**14,320**	**5,210**

Note: Based on public water supply inventory by Division of Water Resources, 1996.

They also occur near springs, reservoirs, bogs, wet meadows, lakes and ponds. Many additional wetlands are also found in the upper watersheds away from the irrigated areas. Wetlands and riparian vegetation are varied and support a large diversity of wildlife species.

The total consumptive use of water by wetlands includes precipitation. Depletion is the net use without precipitation. The water remaining after depletion by wetlands is the supply to satisfy decreed water rights. Only the wetland and open water areas within or adjacent to the irrigated cropland areas were inventoried during the land-use surveys. These wet areas, riparian vegetation strips and open water (including reservoirs) in the water-budget subareas cover 92,000 acres or 1.37 percent of the basin area. The water depleted by these areas is 262,620 acre-feet. This is shown in Table 5-8.

5.4. 5 Instream Flows

Instream flows are non-consumptive and usually contribute to the quality of habitat for water-related species. Manning Creek, now owned by the Division of Wildlife Resources, is the only designated instream flow for water-related wildlife habitat in the Sevier River Basin.

Flows diverted for hydropower production often divert part or all of a stream for a short distance, sometimes reducing habitat quality. There are two hydroelectric power plants in Juab County, seven in Sanpete County and three in Sevier County. These divert water from small tributary streams for power production.[31] For more detail, see Section 18, Industrial Water.

5.4.6 Recreational Water-Related Use

Recreational water uses includes boating, water skiing, fishing and waterfowl hunting. These are all non-consumptive uses. Recreational water consumptive uses are generally for camping and picnicking. There are six state parks, two national parks, one federal recreation area, four national forests and public domain, all with campgrounds, picnic or other areas which require culinary water supplies. Four of the state parks utilize water storage reservoirs for major water sport activities. More detail is given in Section 15, Water-Related Recreation.

5.5 INTERBASIN SURFACE WATER FLOWS AND GROUNDWATER MOVEMENT

There are both surface water flows and groundwater movement into and out of the Sevier River Basin. Surface water transmountain imports are about 1.1 percent of the total tributary surface- water yield. Groundwater movement into the basin is 2.1 percent of the yield and outflow is 4.4 percent. The interbasin water flows are shown on Figure 5-13.

Table 5-7
SECONDARY WATER USE-1996[18]

System Name	Residential	Commercial	Institutional (acre-feet)	Industrial	Total	Served By
GARFIELD						
Hatch	97	0	14	0	110	Hatch Irrigation Co.
Panguitch	168	0	33	0	201	W. Panguitch Irr.(Pang.City)
Non-Community Systems	0	0	0	0	0	
Garfield County Total	265	0	47	0	311	
JUAB						
Eureka	0	0	2	0	2	City secondary well
Non-Community Systems	0	0	0	0	0	
Juab County Total	0	0	2	0	2	
MILLARD						
Delta	34	0	42	0	76	Delta Canal Co.
Deseret-Oasis SS	6	0	0	0	6	Deseret Irrigation Co.
Fillmore	461	0	4	0	465	Fillmore Water Users Assoc.
Hinckley	92	0	56	0	148	Deseret Irrigation Co.
Holden	142	0	0	0	142	Holden Irrigation Co.
Kanosh	178	0	0	0	178	Corn Creek Irrigation Co.
Leamington	6	0	4	0	10	Leamington Irrigation Co.
Lynndyl	0	0	0	0	0	None
Meadow	0	0	0	0	0	Corn Creek Irrigation Co.
Oak City	192	0	0	0	192	Oak City Irrigation
Scipio	0	0	0	0	0	Scipio Irrigation Co.
Sherwood Water Company	3	0	0	0	3	Delta Canal Co.
Non-Community Systems	0	0	0	0	0	
Millard County Total	1,114	0	106	0	1,220	
PIUTE						
Circleville	0	0	15	0	15	Circleville Irrigation Co.
Junction	81	0	12	0	93	City Creek Reservoir Irr.Co.
Kingston	7	0	8	0	15	Kingston Irrigation Water Co.
Non-Community Systems	0	0	0	0	0	
Piute County Total	88	0	35	0	123	
SANPETE						
Axtell	13	0	0	0	13	Willlow Creek Irrigation Co.
Centerfield Wtr&Imp	32	0	75	0	107	Gunnison Irrigation Co.
Ephraim	30	0	0	0	30	Ephraim Irrigation Co.
Fairview	170	0	69	0	239	Cottonwd-Gooseberry Irr.Co.

Table 5-7 Continued ..
SECONDARY WATER USE-1996

System Name	Residential	Commercial	Institutional	Industrial	Total	Served by
Fayette	14	0	0	0	14	New Fayette Irrigation System
Fountain Green	93	0	11	0	105	Fountain Green Irrigation Co.
Gunnison	215	0	65	0	280	Gunnison Irrigation Co.
Manti	570	0	118	0	688	Manti Irrigation Co.
Mayfield	57	0	19	0	76	Mayfield Irrigation Co.
Moroni	273	0	0	0	273	(1) M&M Irrg.(2) Moroni Irr.
Mt. Pleasant	782	0	86	0	868	Mt. Pleasant City
Spring City	598	0	11	0	608	Horseshoe Irrigation Co.
Sterling	72	0	24	0	96	Sterling Irrigation Co.
Wales	7	0	0	0	7	Wales Irrigation Co.
Non-Community Systems					390[a]	
Sanpete County Total	2,926	0	478	0	3,794	
SEVIER						
Annabella	83	0	12	0	95	Annabella Town
Aurora	211	0	24	1	236	Aurora Irrigation Co.
Brooklyn Tapline Co.	2	0	0	0	2	Brooklin Canal Co.
Central Valley	4	0	0	0	4	Elsinore & Richfield Canal Co.
Cove SSD	9	0	0	0	9	Clear Creek Irrigation Co.
Elsinore Town	49	0	0	0	49	Elsinore Irrigation Co.
Glenwood	73	2	2	0	77	Glenwood Irrigation Co.
Joseph	11	0	6	0	17	Joseph Irrigation co.
Koosharem	14	0	12	0	26	Koosharem Irrigation
Monroe	483	0	917	0	1,400	Monroe City
Redmond	378	0	12	0	390	Redmond Lake Irrigation Co.
Richfield	20	0	168	0	188	Richfield City & Piute Irr Co
Salina	587	0	54	0	641	Salina City
Shadow Mnt. Estes. Subdiv.	8	0	0	0	8	Private Wells
Non-Community Systems	0	0	0	0	0	
Sevier County Total	1,932	2	1,207	1	3,142	
BASIN TOTAL	6,325	2	1,875	1	8,592	

Source: Division of Water Resources-Municipal and Industrial Water Supply and Use.
[a] Palisade State Park, 300 acre-feet and Skyline Mountain Resort, 90 acre-feet.

Table 5-8 WET/OPEN WATER DEPLETIONS AND WATER SURFACE EVAPORATION[16]		
Sub-area	Wet Area Depletion (acre-feet\year)	Net Reservoir Evaporation (acre-feet\year)
Garfield	8,830	2,370
Iron	130	0
Juab	23,840	2,520
Kane	480	80
Millard	45,940	16,050
Piute	22,450	7,850
Sanpete	76,910	16,030
Sevier	38,130	1,000
Total	216,710	45,910

5.5.1 Surface Water Imports

There are 15 canals and tunnels located along the Wasatch Plateau between Fairview and Ephraim where water is imported into Sanpete Valley. The application for the first transmountain import was filed in 1914. The filing was for 6 cfs from Cottonwood Creek in the Colorado River drainage to Oak Creek near Spring City in the San Pitch River drainage.

The transmountain imports bring 9,340 acre-feet of water annually from the Price River and San Rafael river drainages to the San Pitch River drainage. They collect water from the snowpack on the eastern slopes, often using perforated corrugated metal pipe, and deliver it through tunnels or in open canals. There have been periodic disputes over these imports betweeen east slope and west slope water users.

Data for 13 of these import locations are shown in Table 5-9. Locations are shown on Figure 5-14.

5.5.2 Surface Water Exports

The Tropic and East Fork Canal is the largest surface water diversion out of the basin. In fact, the Tropic and East Fork Canal delivers the only water imported into the Colorado River Basin. This canal diverts 4,800 acre-feet of water stored in Tropic Reservoir on the East Fork of the Sevier River into the Tropic area in the Colorado River Basin. The Roy Tanner Ditch near Milburn diverts about 100 acre-feet from the San Pitch River Drainage to Indianola in the Utah Lake Basin.

5.5.3 Transbasin Groundwater Movement[63]

Its estimated there are at least 6,700 acre-feet of groundwater flowing from the west slopes of the northern Gunnison Plateau above Nephi into the Fountain Green-Wales area. This water originates as precipitation on the west slope and follows a system of joints, fractures and bedding planes along the dip of a synclinal structure (primarily Indianola conglomerate), to the spring areas at the base of the east slope.

There is some evidence that a large part of the base flow of Antimony Creek comes from the Awapa Plateau in the Fremont River drainage.

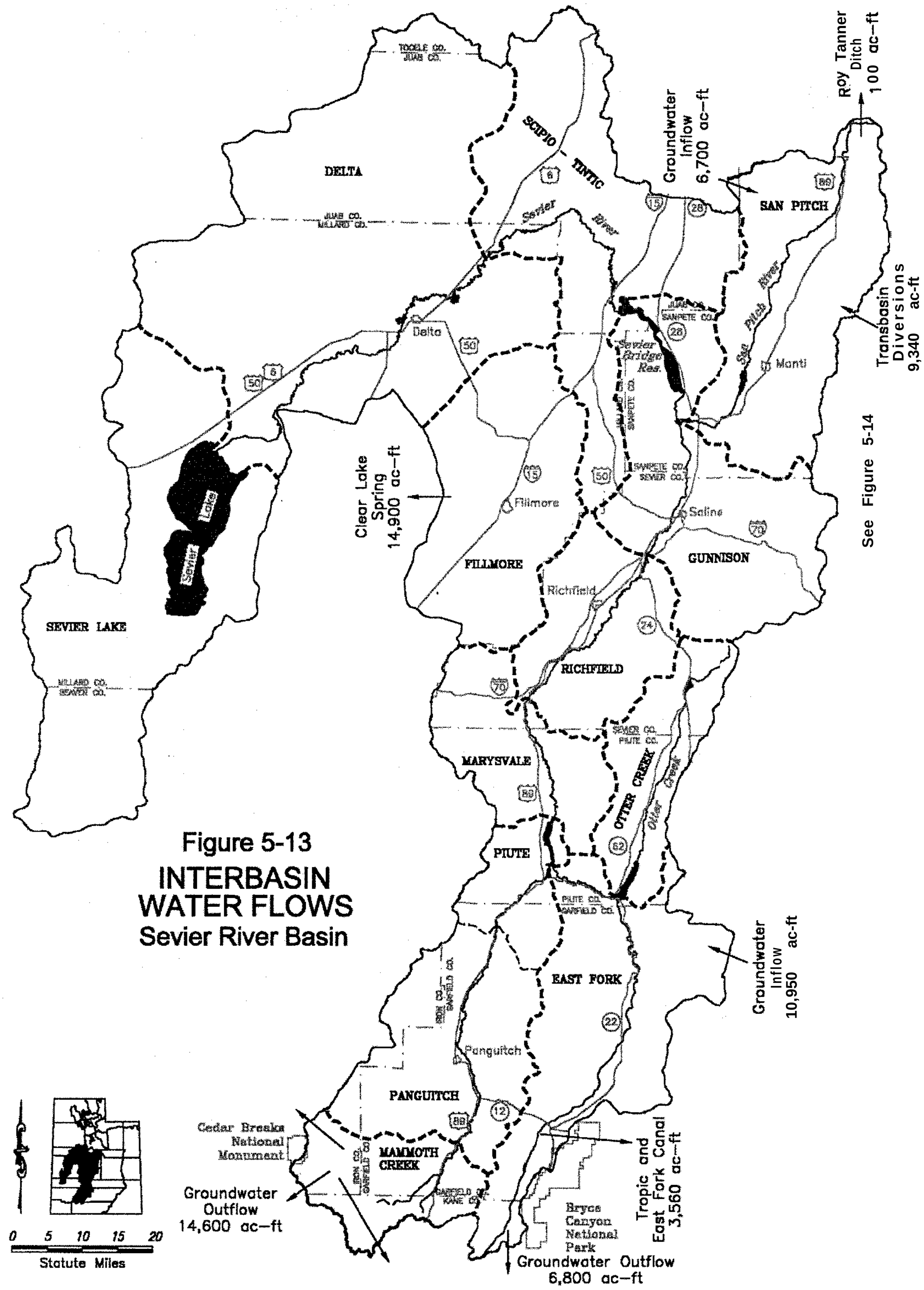


Figure 5-13
INTERBASIN WATER FLOWS
Sevier River Basin

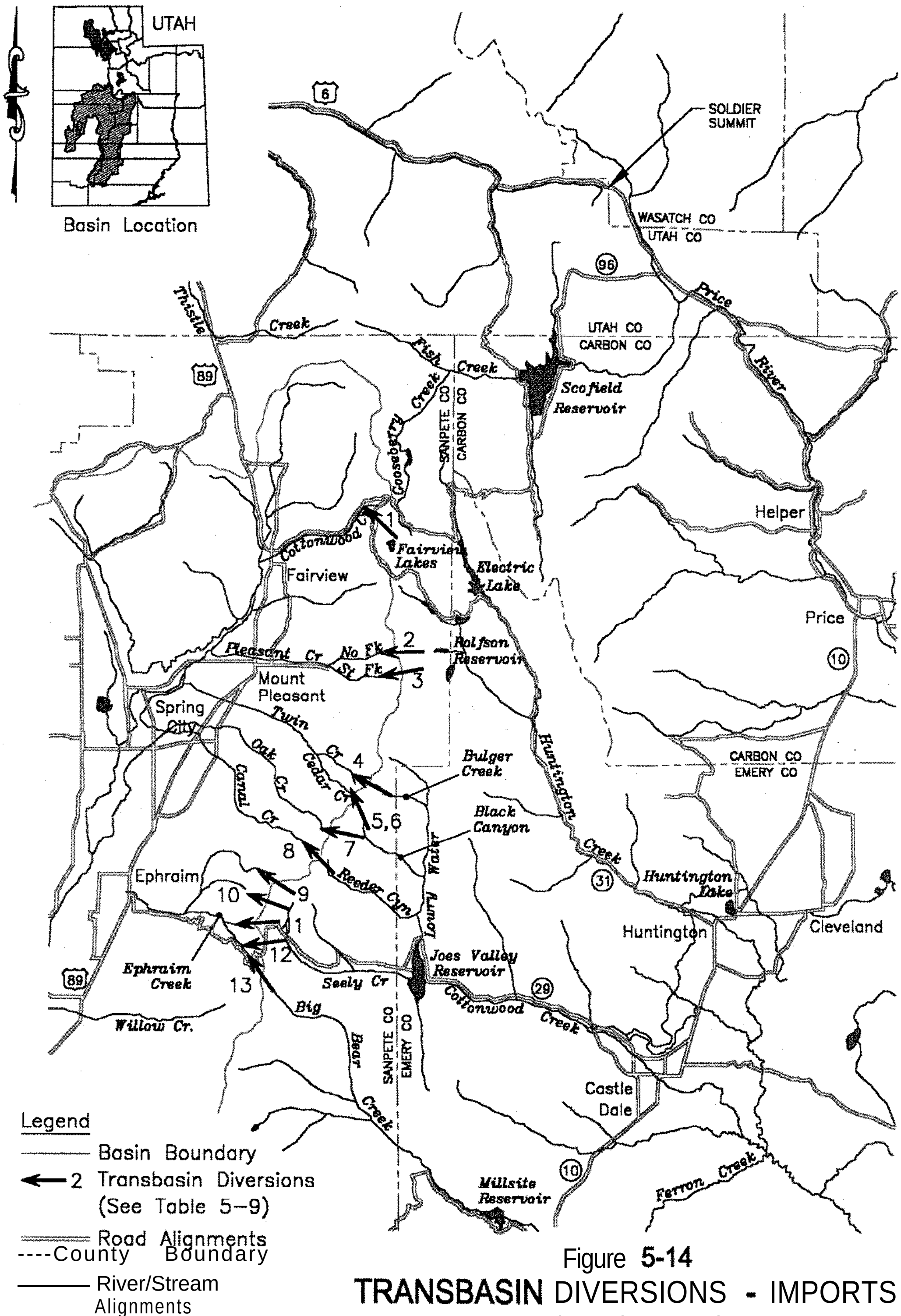


Figure **5-14**

TRANSBASIN DIVERSIONS - IMPORTS

Sevier River Basin

Table 5-9 SURFACE WATER IMPORTS		
Conveyance	Maximum Flow (cfs)	Volume (acre-feet/year)
Fair-view Lakes (Gooseberry)	NA	2,470
Candland Ditch	NA	200
Coal Fork Irrigation Co.	NA	260
Twin Creek Tunnel	NA	200
Cedar Creek Tunnel	NA	340
Black Canyon Ditch	NA	290
Spring City Tunnel	NA	1,900
Reeder Ditch	NA	250
Horseshoe Canal	NA	600
Larson Tunnel	30	690[a]
Ephraim Tunnel	NA	1,900
Madison Ditch	15	40
John August Ditch	NA	200
Total		9,340

[a] Longest transmountain diversion tunnel - 2,200 feet

Much of the constant base flow of 15 cfs or nearly 11,000 acre-feet comes from large spring areas in the upper reaches of the drainage. This much flow would require a supply outside the basin.

The upper watersheds of the southern Sevier River drainage contribute significant quantities of groundwater outflow. It has been estimated 6,800 acre-feet of groundwater from the East Fork of the Sevier River contributes to Kanab Creek-Johnson Wash flows. There is about 14,600 acre-feet of groundwater outflow from the south edges of the Markagunt Plateau (Cedar Mountain) into the Virgin River tributaries and from the west edges into the Great Basin. This groundwater outflow includes water from Navajo Lake that flows into sink holes in the lake bottom, a large part of which reappears in Cascade Spring in the North Fork of the Virgin River.

5.6 WATER QUALITY

The stream and river flows are generally of good quality in the upper reaches, but deteriorate as they flow downstream. Upstream from Richfield, concentrations of dissolved solids in the Sevier River are generally less than 300 mg/L (milligrams per liter) or 509 μS/cm (microsiemens per centimeter - a term used to report specific conductance). See Section A for definitions of water quality terms. Downstream concentrations increase, especially in the Central Sevier Valley area. The dissolved solids in Brine and Lost creeks range from 1,180 mg/L to 29,500 mg/L (2,000 μs/cm to 50,000 μS/cm). Part of the increase in dissolved solids comes from irrigation water leaching salt into the return flows but most of the increase is from geologic sources such as the Arapien shale. Sevier River water south of Redmond has dissolved solids of about 1,040 mg/L (1,763 μS/cm).

Groundwater inflow between Redmond and Sevier Bridge Reservoir contributes large quantities of dissolved solids. The tributary streams flowing into the San Pitch River are good quality.

However, the San Pitch River below Melburn was 448 mg/L (760 μS/cm) while the lower reaches below Gunnison Reservoir were about 920 mg/L (1,560 μS/cm). Late summer flows (1964) at the Juab gage were 1,590 mg/L and 1,380 mg/L near Lynndyl. Flows at Lynndyl were 1,025 mg/L in 1988. Flows in Chicken Creek were 263 mg/L (445 μS/cm) above Levan while a 1993 sample below the Chicken Creek Reservoir outlet showed 780 mg/L (1,320 μS/cm). Samples from Chicken Creek near Mills showed 4,290 mg/L (7,270 μmhos/cm) with a flow of 0.5 cfs during June 1963.

Tributary inflows measured in 1985 in Pahvant Valley are generally of good quality (240-435 mg/L or 400-700 μS/cm) but the groundwater is becoming increasingly contaminated with the dissolved solids exceeding 2,950 mg/L (5,000 μS/cm) in some locations. See Section 12, Water Quality and Section 19, Groundwater, for more information.


Good water quality is important